AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Canceled)

2. A digital communications transmitter circuit as claimed in claim [1] 5 wherein said pulse-spreading filter is a Nyquist-type filter.

3. A digital communications transmitter circuit as claimed in claim [1] 5 wherein said combining circuit is configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to reduce a peak magnitude component of said filtered signal stream.

4. A digital communications transmitter circuit as claimed in claim 3 wherein said combining circuit is a complex summing circuit.

5. A constrained-envelope digital communications transmitter circuit comprising:

a pulse-spreading filter configured to receive a quadrature phase-point signal stream of digitized quadrature phase points and produce a filtered signal stream, said filtered signal stream exhibiting energy corresponding to each phase point spread throughout a plurality of unit baud intervals;

a constrained-envelope generator coupled to said pulse-spreading filter and configured to produce a constrained-bandwidth error signal stream;

a combining circuit coupled to said pulse-spreading filter and to said constrained envelope generator, said combining circuit configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained envelope signal stream; and

a substantially linear amplifier having an input coupled to said combining circuit;

[A digital communications transmitter circuit as claimed in claim 1] wherein:

said pulse-spreading filter is a first pulse-spreading filter;

said transmitter circuit additionally comprises a delay element coupled between said first pulse-spreading filter and said combining circuit; and

said constrained-envelope generator comprises a second pulse-spreading filter coupled to said combining circuit.

6. A digital communications transmitter circuit as claimed in claim 5 wherein:

said first pulse-spreading filter is configured so that each phase point is transformed into a Nyquist-type datum burst extending over a plurality of unit baud intervals, having a datum-burst peak value occurring in one of said plurality of unit baud intervals and datum-burst zero values occurring substantially at integral unit baud intervals away from said datum-burst peak value, so that said filtered signal stream in each unit baud interval substantially equals the sum of said Nyquist-type datum bursts from a plurality of phase points; and

said constrained-envelope generator is configured so that said second pulse spreading filter receives error pulses, transforms each error pulse into a Nyquist-type error burst extending over a plurality of unit baud intervals, having an error-burst peak value occurring in one of said plurality of unit baud intervals and error-burst zero values occurring substantially at integral unit baud intervals away from said error-burst peak value, so that said constrained-bandwidth error signal stream in each unit baud interval substantially equals the sum of said Nyquist-type error bursts from a plurality of error pulses.

7. A digital communications transmitter circuit as claimed in claim 6 wherein said constrained-envelope generator is configured so that said Nyquist-type error bursts exhibit said error-burst peak values and said error-burst zero values at instances in time when said Nyquist-type datum bursts exhibit neither said datum-burst peak values nor said datum-burst zero values.

8. A digital communications transmitter circuit as claimed in claim 7 wherein said constrained-envelope generator is configured so that said error-burst peak values and said error-burst zero values occur approximately midway between said datum-burst peak values and said datum-burst zero values.

9. A digital communications transmitter circuit as claimed in claim 5 wherein said first and second pulse-spreading filters exhibit substantially equivalent transfer characteristics.

10. A digital communications transmitter circuit as claimed in claim 5 wherein:

said first pulse-spreading filter receives one quadrature phase point per unit baud interval and produces two complex samples of said filtered signal stream per unit baud interval;

said constrained-envelope generator evaluates one of said two complex samples of said filtered signal stream produced by said first pulse-spreading filter per unit baud interval; and said second pulse-spreading filter receives one error pulse per unit baud interval and produces two complex samples of said constrained-envelope error-signal stream per unit baud interval.

11. <u>A constrained-envelope digital communications transmitter circuit comprising:</u>

<u>a pulse-spreading filter configured to receive a quadrature phase-point signal stream of digitized quadrature phase points and produce a filtered signal stream, said filtered signal stream exhibiting energy corresponding to each phase point spread throughout a plurality of unit baud intervals;</u>

<u>a constrained-envelope generator coupled to said pulse-spreading filter and configured to produce a constrained-bandwidth error signal stream;</u>

<u>a combining circuit coupled to said pulse-spreading filter and to said constrained envelope generator, said combining circuit configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained envelope signal stream; and</u>

<u>a substantially linear amplifier having an input coupled to said combining circuit;</u>

[A digital communications transmitter circuit as claimed in claim 1] wherein:

said filtered signal stream is a stream of complex digital values, with each of said complex digital values exhibiting a peak magnitude component; and

said constrained-envelope generator is configured to determine when ones of said peak magnitude components exceed a threshold value.

12. A digital communications transmitter circuit as claimed in claim 11 wherein:

said transmitter circuit additionally comprises a phase mapper coupled to said pulse-spreading filter and configured to select said digitized quadrature phase points from a phase-point constellation, said phase-point constellation having a maximum magnitude phase point; and

said threshold value is a magnitude value approximately equal to a magnitude of said maximum-magnitude phase point.

13. A digital communications transmitter circuit as claimed in claim [1] 12 additionally comprising an interleaver coupled to said phase mapper.

14. A constrained-envelope digital communications transmitter circuit comprising:

a pulse-spreading filter configured to receive a quadrature phase-point signal stream of digitized quadrature phase points and produce a filtered signal stream, said filtered signal stream exhibiting energy corresponding to each phase point spread throughout a plurality of unit baud intervals;

a constrained-envelope generator coupled to said pulse-spreading filter and configured to produce a constrained-bandwidth error signal stream;

a combining circuit coupled to said pulse-spreading filter and to said constrained envelope generator, said combining circuit configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained envelope signal stream; and

a substantially linear amplifier having an input coupled to said combining circuit;

[A digital communications transmitter circuit as claimed in claim 1] wherein:

said constrained-envelope generator is an off-time constrained-envelope generator;

said constrained-bandwidth error signal stream is an off-time constrained bandwidth error signal stream;

said transmitter circuit additionally comprises an on-time constrained envelope generator coupled to said pulse-spreading filter and configured to produce an on-time constrained-bandwidth error signal stream; and

said combining circuit is coupled to said pulse-spreading filter, to said off-time constrained-envelope generator, and to said on-time constrained-envelope generator, and said combining circuit is configured to combine said filtered signal stream, said off-time constrained-bandwidth error signal stream, and said on-time constrained-bandwidth error signal stream to produce said constrained-envelope signal stream.

15. A constrained-envelope digital communications transmitter circuit comprising:

a pulse-spreading filter configured to receive a quadrature phase-point signal stream of digitized quadrature phase points and produce a filtered signal stream, said filtered signal stream exhibiting energy corresponding to each phase point spread throughout a plurality of unit baud intervals;

a constrained-envelope generator coupled to said pulse-spreading filter and configured to produce a constrained-bandwidth error signal stream;

a combining circuit coupled to said pulse-spreading filter and to said constrained envelope generator, said combining circuit configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained envelope signal stream; and

a substantially linear amplifier having an input coupled to said combining circuit;

[A digital communications transmitter circuit as claimed in claim 1] wherein said substantially linear amplifier comprises:[;]

a digital linearizer configured to pre-distort said constrained-envelope signal stream into a pre-distorted digital signal stream;

a digital-to-analog converter coupled to said digital linearizer and configured to produce an analog baseband signal from said pre-distorted digital signal stream; and

a radio-frequency amplifying circuit configured to generate a radiofrequency broadcast signal from said analog baseband signal.

16. (Canceled)

17. A transmission method as claimed in claim [16] 18 wherein said combining step comprises the step of reducing a peak magnitude component of said filtered signal stream.

18. In a digital communications system, a method for the transmission of a constrained-envelope communications signal, said transmission method comprising the steps of:

filtering a quadrature phase-point signal stream to produce a filtered signal stream, said filtering step spreading energy from each phase point in said filtered signal stream over a plurality of unit baud intervals;

generating a constrained-bandwidth error signal stream from said filtered signal stream and a threshold signal;

combining said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained-envelope signal stream;

linearly amplifying said constrained-envelope signal stream to produce said constrained-envelope communications signal; and

transmitting said constrained-envelope communications signal;

[A transmission method as claimed in claim 16] wherein:

said generating step comprises the step of filtering an error signal stream having one error pulse per unit baud interval to produce said constrained-bandwidth error signal stream, said filtering step spreading energy from each error pulse in said error signal stream over a plurality of unit baud intervals;

said transmission method additionally comprises the step of delaying said filtered signal stream to produce a delayed signal stream; and

said combining step combines said delayed signal stream and said constrained-bandwidth error signal stream to produce said constrained-envelope signal stream.

19. In a digital communications system, a method for the transmission of a constrained-envelope communications signal, said transmission method comprising the steps of:

filtering a quadrature phase-point signal stream to produce a filtered signal stream, said filtering step spreading energy from each phase point in said filtered signal stream over a plurality of unit baud intervals;

generating a constrained-bandwidth error signal stream from said filtered signal stream and a threshold signal;

combining said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained-envelope signal stream;

linearly amplifying said constrained-envelope signal stream to produce said constrained-envelope communications signal; and

transmitting said constrained-envelope communications signal;

[A transmission method as claimed in claim 16] wherein:

said filtering step comprises the step of receiving one quadrature phase point per unit baud interval;

said filtering step additionally comprises the step of producing two complex samples of said filtered signal stream per unit baud interval;

said generating step comprises the step of evaluating one of said two complex samples of said filtered signal stream per unit baud interval to produce an error signal stream having one error pulse per unit baud interval; and

said generating step additionally comprises the step of filtering said error signal stream to produce said constrained-bandwidth error signal stream having two complex samples of said constrained-bandwidth error signal stream per unit baud interval.

20. A transmission method as claimed in claim 19 wherein said generating step additionally comprises the steps of:

providing said threshold signal; and

determining when ones of peak magnitude components of a stream of complex digital values of said filtered signal stream exceed a threshold value of said threshold signal.

21. In a digital communications system, a method for the transmission of a constrained-envelope communications signal, said transmission method comprising the steps of:

filtering a quadrature phase-point signal stream to produce a filtered signal stream, said filtering step spreading energy from each phase point in said filtered signal stream over a plurality of unit baud intervals;

generating a constrained-bandwidth error signal stream from said filtered signal stream and a threshold signal;

combining said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained-envelope signal stream;

linearly amplifying said constrained-envelope signal stream to produce said constrained-envelope communications signal; and

transmitting said constrained-envelope communications signal;

[A transmission method as claimed in claim 16] wherein:

said filtered signal stream includes two or more complex digital values per unit baud interval, said complex digital values in said filtered signal stream exhibiting local peak magnitudes; and

said generating step is configured so that said constrained-bandwidth error signal stream includes two or more complex values per unit baud interval, said complex values in said constrained-bandwidth error signal stream being responsive to said local peak magnitudes of said filtered signal stream so as to spread energy from selected ones of said local peak magnitudes over a plurality of unit baud intervals of said constrained-bandwidth error signal stream.

22. A transmission method as claimed in claim [16] <u>18</u> wherein said transmitting step continuously transmits said constrained-envelope communications signal.

23. A constrained-envelope digital-communications transmitter circuit comprising:

a binary data source configured to provide a binary input signal stream;

a phase mapper coupled to said binary data source and configured to produce a quadrature phase-point signal stream, wherein said phase-point signal stream has a predetermined number of symbols per unit baud interval, said predetermined number of symbols defining a phase point in a phase-point constellation;

a Nyquist-type filter coupled to said phase mapper and configured to produce a filtered signal stream;

a constrained-envelope generator coupled to said Nyquist-type filter and configured to produce a constrained-bandwidth error signal stream;

a delay element coupled to said Nyquist-type filter and configured to produce a delayed signal stream synchronized with said constrained-bandwidth error signal stream;

a complex summing circuit coupled to said delay element and said constrained envelope generator and configured to produce a constrained-envelope signal stream; and

a substantially linear amplifier coupled to said complex summing circuit and configured to produce a radio-frequency broadcast signal.

24. A digital-communications transmitter circuit as claimed in claim 23 wherein said Nyquist-type filter is a first Nyquist-type filter, said filtered signal stream includes a first filtered-signal data stream and a second filtered-signal data stream, and said complex summing circuit is a first complex summing circuit, wherein said transmitter circuit additionally comprises a quadrature threshold generator configured to-provide a threshold signal, said threshold signal having a threshold value, and wherein said constrained-envelope generator comprises:

a complex summing circuit coupled to said first Nyquist-type filter and said quadrature threshold generator and configured to produce a difference signal stream, wherein said difference signal stream is a stream of difference pulses having difference pulse values of a first polarity and difference-pulse values of a second polarity;

a discriminator coupled to said complex summing circuit and configured to produce an error signal stream from said difference signal stream, wherein said error signal stream is a stream of error pulses substantially coincident with said difference pulses of said difference signal stream, and wherein, when ones of said difference pulses have said first-polarity difference-pulse values, said coincident error pulses have error-pulse values substantially equal to said first-polarity difference-pulse values, and when ones of said difference pulses have said second-polarity difference-pulse values, said coincident error pulses have error-pulse values substantially equal to zero; and

a second Nyquist-type filter coupled to said discriminator and configured to produce said constrained-bandwidth error signal stream.

25. A digital-communications transmitter circuit as claimed in claim 24 wherein said transmitter circuit additionally comprises:

a convolutional encoder coupled to said binary data source and configured to produce an encoded signal stream; and

an interleaver coupled to said convolutional encoder and configured to produce an interleaved signal stream by temporally decorrelating said encoded signal stream.

26. A digital-communications transmitter circuit as claimed in claim 24 wherein:

said filtered signal stream is a quadrature signal stream having a locus that passes proximate one of said phase points of said phase-point constellation at integral unit baud intervals;

said first filtered-signal data stream comprises on-time samples of said filtered signal stream, each of said on-time samples occurring substantially coincident ally with said passage of said filtered signal locus proximate one of said phase points of said phase-point constellation; and

said second filtered-signal data stream comprises off-time samples of said filtered signal stream wherein each of said off-time samples occurs between adjacent ones of said on-time samples.

27. A digital-communications transmitter circuit as claimed in claim 26 wherein each of said off-time samples occurs substantially midway between adjacent ones of said on-time samples.

28. A digital-communications transmitter circuit as claimed in claim 23 additionally comprising an interleaver coupled to said binary data source and configured to provide an interleaved signal stream.

29. A digital-communications transmitter circuit as claimed in claim 23 wherein said constellation is an amplitude and phase shift keying constellation.

30-37. (Cancelled)

38. The digital communications transmitter circuit as claimed in claim 5, wherein the delay element is a fixed delay element.

39. In the digital communications system, the method for the transmission of the constrained-envelope communications signal of claim 18, wherein said step of delaying comprises delaying said filtered signal stream bv a fixed delay to produce the delayed signal stream.

40. The constrained-envelope digital-communications transmitter circuit of claim 23 wherein the delay element is a fixed delay element.

41. A constrained-envelope digital communications transmitter circuit comprising:

a pulse-spreading filter configured to receive a quadrature phase-point signal stream of digitized quadrature phase points and produce a filtered signal stream, said filtered signal stream exhibiting energy corresponding to each phase point spread throughout a plurality of unit baud intervals;

a constrained-envelope generator coupled to said pulse-spreading filter and configured to produce a constrained-bandwidth error signal stream;

a combining circuit coupled to said pulse-spreading filter and to said constrained envelope generator, said combining circuit configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained envelope signal stream;

a substantially linear amplifier having an input coupled to said combining circuit; - and

a delay element coupled between said pulse-spreading filter and said combining circuit.

42. A digital communications transmitter circuit as claimed in claim 41 wherein said pulse-spreading filter is a Nyquist-type filter.

43. (Amended) A digital communications transmitter circuit as claimed in claim 41 wherein said combining circuit is configured to combine said filtered signal stream and said constrained-bandwidth error signal stream to reduce a peak magnitude component of said filtered signal stream.

44. A digital communications transmitter circuit as claimed in claim 43 wherein said combining circuit is a complex summing circuit.

45. A digital communications transmitter circuit as claimed in claim 41 wherein:

said pulse-spreading filter is a first pulse-spreading filter; and

said constrained-envelope generator comprises a second pulse-spreading filter coupled to said combining circuit.

46. A digital communications transmitter circuit as claimed in claim 41, wherein the delay element is a fixed delay element.

47. A digital communications transmitter circuit as claimed in claim 45 wherein:

said first pulse-spreading filter is configured so that each phase point is transformed into a Nyquist-type datum burst extending over a plurality of unit baud intervals, having a datum-burst peak value occurring in one of said plurality of unit baud intervals and datum-burst zero values occurring substantially at integral unit baud intervals away from said datum-burst peak value, so that said filtered signal stream in each unit baud interval substantially equals the sum of said Nyquist-type datum bursts from a plurality of phase points; and

said constrained-envelope generator is configured so that said second pulse spreading filter receives error pulses, transforms each error pulse into a Nyquist-type error burst extending over a plurality of unit baud intervals, having an error-burst peak value occurring in one of said plurality of unit baud intervals and error-burst zero values occurring substantially at integral unit baud intervals away from said error-burst peak value, so that said constrained-bandwidth error signal stream in each unit baud interval substantially equals the sum of said Nvquist-tvpe error bursts from a plurality of error pulses.

48. A digital communications transmitter circuit as claimed in claim 47 wherein said constrained-envelope generator is configured so that said Nvquist-tvpe error bursts exhibit said error-burst peak values and said error-burst zero values at instances in time when said Nvquist-tvpe datum bursts exhibit neither said datum-burst peak values nor said datum-burst zero values.

49. A digital communications transmitter circuit as claimed in claim 48 wherein said constrained-envelope generator is configured so that said error-burst peak values and said error-burst zero values occur approximately midway between said datum-burst peak values and said datum-burst zero values.

50. A digital communications transmitter circuit as claimed in claim 45 wherein said first and second pulse-spreading filters exhibit substantially equivalent transfer characteristics.

51. A digital communications transmitter circuit as claimed in claim 45 wherein:

said first pulse-spreading filter receives one quadrature phase point per unit baud interval and produces two complex samples of said filtered signal stream per unit baud interval;

said constrained-envelope generator evaluates one of said two complex samples of said filtered signal stream produced by said first pulse-spreading filter per unit baud interval; and said second pulse-spreading filter receives one error pulse per unit baud interval and produces two complex samples of said constrained-envelope error-signal stream per unit baud interval.

52. A digital communications transmitter circuit as claimed in claim 41 wherein:

said filtered signal stream is a stream of complex digital values, with each of said complex digital values exhibiting a peak magnitude component; and

said constrained-envelope generator is configured to determine when ones of said peak magnitude components exceed a threshold value.

53. A digital communications transmitter circuit as claimed in claim 52 wherein:

said transmitter circuit additionally comprises a phase mapper coupled to said pulse-spreading filter and configured to select said digitized quadrature phase points from a phase-point constellation, said phase-point constellation having a maximum magnitude phase point; and

said threshold value is a magnitude value approximately equal to a magnitude of said maximum-magnitude phase point.

54. A digital communications transmitter circuit as claimed in claim 41 additionally comprising an interleaver coupled to said phase mapper.

55. A digital communications transmitter circuit as claimed in claim 41 wherein:

said constrained-envelope generator is an off-time constrained-envelope generator;

said constrained-bandwidth error signal stream is an off-time constrained bandwidth error signal stream;

said transmitter circuit additionally comprises an on-time constrained-envelope generator coupled to said pulse-spreading filter and configured to produce an on-time constrained-bandwidth error signal stream; and

said combining circuit is coupled to said pulse-spreading filter, to said off-time constrained-envelope generator, and to said on-time constrained-envelope generator, and said combining circuit is configured to combine said filtered sianal stream, said off-time constrained-bandwidth error signal stream, and said on-time constrained bandwidth error signal stream to produce said constrained-envelope signal stream.

56. A digital communications transmitter circuit as claimed in claim 41 wherein said substantially linear amplifier comprises;

a digital linearizer configured to pre-distort said constrained-envelope signal stream into a pre-distorted digital signal stream;

a digital-to-analog converter coupled to said digital linearizer and configured to produce an analog baseband signal from said pre-distorted digital signal stream; and

a radio-frequency amplifying circuit configured to generate a radio-frequency broadcast signal from said analog baseband signal.

57. In a digital communications system, a method for the transmission of a constrained-envelope communications signal, said transmission method comprising the steps of:

filtering a quadrature phase-point signal stream to produce a filtered signal stream, said filtering step spreading energy from each phase point in said filtered signal stream over a plurality of unit baud intervals;

delaying said filtered signal stream;

generating a constrained-bandwidth error signal stream from said filtered signal stream and a threshold signal;

combining said filtered signal stream and said constrained-bandwidth error signal stream to produce a constrained-envelope signal stream;

linearly amplifying said constrained-envelope signal stream to produce said constrained-envelope communications signal; and

transmitting said constrained-envelope communications signal.

58. A transmission method as claimed in claim 57 wherein said combining step comprises the step of reducing a peak magnitude component of said filtered signal stream.

59. A transmission method as claimed in claim 57 wherein:

said generating step comprises the step of filtering an error signal stream having one error pulse per unit baud interval to produce said constrained-bandwidth error signal stream, said faltering step spreading energy from each error pulse in said error signal stream over a plurality of unit baud intervals;

said step of delaying said filtered signal stream comprises producing a delayed signal stream; and

said combining step combines said delayed signal stream and said constrained bandwidth error signal stream to produce said constrained-envelope signal stream.

60. A transmission method as claimed in claim 59, wherein said step of delaving said filtered signal stream comprises delaying said filtered signal stream bv a fixed delay to produce the delayed signal stream.

61. A transmission method as claimed in claim 57 wherein:

said filtering step comprises the step of receiving one quadrature phase point per unit baud interval;

said filtering step additionally comprises the step of producing two complex samples of said filtered signal stream per unit baud interval;

said generating step comprises the step of evaluating one of said two complex samples of said filtered signal stream per unit baud interval to produce an error signal stream having one error pulse per unit baud interval; and

said generating step additionally comprises the step of filtering said error signal stream to produce said constrained-bandwidth error signal stream having two complex samples of said constrained-bandwidth error signal stream per unit baud interval.

62. A transmission method as claimed in claim 61 wherein said generating step additionally comprises the steps of:

providing said threshold signal; and

determining when ones of peak magnitude components of a stream of complex digital values of said filtered signal stream exceed a threshold value of said threshold signal.

63. A transmission method as claimed in claim 57 wherein:

said filtered signal stream includes two or more complex digital values per unit baud interval, said complex digital values in said filtered signal stream exhibiting local peak magnitudes; and

said generating step is configured so that said constrained-bandwidth error signal stream includes two or more complex values per unit baud interval, said complex values in said constrained-bandwidth error signal stream being responsive to said local peak magnitudes of said filtered signal stream so as to spread energy from selected ones of said local peak magnitudes over a plurality of unit baud intervals of said constrained bandwidth error signal stream.

64. A transmission method as claimed in claim 57 wherein said transmitting step continuously transmits said constrained-envelope communications signal.

STATUS OF CLAIMS

1. Cancelled

2-15. Pending

16. Cancelled

30-37. Cancelled

38-64. Pending